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is not really a case of uncorrelating the correlated. The *Advanced Algebra* contains in revised form and with some additions the material of the chapters on algebra in the original Brenke book, and a similar statement is true of the *Trigonometry.* The books may be had separately or bound together in one volume.

Correlation has been talked about for many years and some books on unified mathematics have been published. But most of the teaching of mathematics in this country is still done by means of the more or less old-fashioned text-books on algebra, trigonometry, etc., as separate subjects. The latest attempt at a correlation of college algebra, trigonometry and analytic geometry is the new *Elementary Mathematical Analysis* by J. W. Young and F. M. Morgan of Dartmouth College. Later it will be reviewed at length in the MONTHLY.

PROBLEMS FOR SOLUTION.

SEND ALL COMMUNICATIONS ABOUT PROBLEMS TO B. F. FINKEL, Springfield, Mo.

2680. Proposed by C. C. YEN, Tangshan, North China.

The diagonals of a maximum parallelogram inscribed in an ellipse are conjugate diameters of the ellipse. [From Joseph Edward's *Elementary Treatise on Differential Calculus.*]

2681. Proposed by PHILIP FRANKLIN, College of the City of New York.

Given n letters of one kind and $n-1$ letters of another kind, in how many ways can they be arranged so that, moving along the arrangement from one end to the other, the number of letters of the first kind passed over is greater than the number of the second kind at any instant?

2682. Proposed by E. L. REES, University of Kentucky.

Given the diagonal and the angle it makes with a bisector of one of the angles of a parallelogram. Construct the parallelogram so that the rectangle having sides equal to those of the parallelogram may have a given area.

2683. Proposed by J. R. HITT, Student, Mississippi College.

The height of a frustum of a cone is h, the radii of the lower and upper circular bases are a and b, respectively. Deduce a formula for finding the center of gravity of the frustum.

2684. Proposed by B. J. BROWN, Kansas City, Mo.

Find the locus of the center of a conic passing through four fixed points.

2685. Proposed by JOSEPH B. REYNOLDS, Lehigh University.

A particle is describing an ellipse of eccentricity $\sqrt{2/3}$ as a central orbit about a focus when the attracting force suddenly becomes repulsive without changing its magnitude and the particle begins to describe an equilateral hyperbola; find where the change occurred and the angle that the major axis of the new orbit makes with that of the old orbit.

2686. Proposed by EDWIN R. SMITH, State College, Pa.

Given the difference equation

$$u_{x+1} - u_x = \log\left(1 - \frac{x}{sp}\right) - \log\left(1 + \frac{x+1}{sq}\right).$$

where s is a positive integer, p and q are proper fractions such that $p + q = 1$, and x is small when compared with sp and sq. Determine T_x, if $u_x = \log T_x$.

2687. Proposed by N. P. PANDYA, Sojitra, India.

An ellipse intersects a parabola in A and B, and the tangents at A and B to the parabola meet at T. The center C of the ellipse lies within the space enclosed by the parabola and the tangents. Draw a third tangent to the parabola such that C may be the centroid of the triangle formed by the three tangents.

2688. Proposed by FRANK IRWIN, University of California.

With four quantities, a_1, a_2, a_3, a_4, we may, without changing their order, form the following complex fractions:

$$\dfrac{a_1}{\dfrac{a_2}{\dfrac{a_3}{a_4}}} \qquad \dfrac{a_1}{\dfrac{\dfrac{a_2}{a_3}}{a_4}} \qquad \dfrac{\dfrac{a_1}{a_2}}{\dfrac{a_3}{a_4}} \qquad \dfrac{\dfrac{a_1}{\dfrac{a_2}{a_3}}}{a_4} \qquad \dfrac{\dfrac{\dfrac{a_1}{a_2}}{a_3}}{a_4}$$

But these have not all different values; the first and fourth are equal.

Determine how many different rational functions of the quantities a_1, a_2, $\cdots$ a_n may be obtained in this way, and which can be represented in more than one way as a complex fraction of the above kind, and which in only one way.

Restatement of 434 (Calculus). Proposed by E. W. CHITTENDEN, Champaign, Ill.

Evaluate $\int_0^1 f(x)dx$ where

$$f(x) = \sum_{n=1}^{n=\infty} \frac{\operatorname{sgn}(x - x_n)}{2^n}.$$

The function $\operatorname{sgn} x = -1, 0, +1$ according as x is negative, zero or positive. The numbers x_n form the series

$$\tfrac{1}{2}, \tfrac{1}{4}, \tfrac{3}{4}, \tfrac{1}{8}, \tfrac{3}{8}, \tfrac{5}{8}, \tfrac{7}{8}, \cdots$$

for which the general formula is $x_n = (2h + 1)/2^k$, where k is the greatest integer such that $2^{k-1} \leqq n$ and $h = n - 2^{k-1}$.

Note. This problem is reprinted because of a misprint in the original statement and also because of a lack of definiteness in the definition of the series of values x_n. An inquiry has also been received in regard to the origin of the notation "sgn x." This notation seems to be due to Kronecker; cf. Werke, Vol. II, p. 500.

SOLUTIONS OF PROBLEMS.

487 (Algebra). Proposed by WILLIAM HOOVER, Columbus, Ohio.

Show in two ways that 0.5623 is not a root of $(1 - m)e^m = 2e^{-1}$, e being the Napierian base. Find the value of m, and test the result in two ways.

SOLUTION BY E. E. WHITFORD, New York City.

Taking logarithms of both sides, we have

$$\log(1 - m) + (m + 1)\log e = \log 2, \quad \text{or} \quad \log(1 - m) = \log 2 - 1 - m.$$

Substituting .5623 for m,

$$\log .4377 = .6931 - 1 - .5623 = 9.1308 - 10.$$

But this is false since $\log .4377 = 9.1733 - 10$. Or, from $(1 - m)e^{m+1} = 2$, on taking $m = .5623$ we have $e^{1.5623} = 4.57$. But this is false, since $4.57 = e^{1.5195}$. One value of m is .5936 approximately; this checks by both the above methods. We may also have $m = -1$.

Also solved by C. E. FLANAGAN and EDWARD H. WORTHINGTON.